

STATUS REPORT  
NASA Grant Nsg-465, Vanderbilt University  
Report of December 15, 1965  
covering period from  
May 15, 1965 to December 15, 1965

6 pages  
Code - none  
CR-76296

N66 81663

GENERAL STATEMENT

The project has been underway about 30 months. Since the last report, emphasis has been on preparation of structure maps and geologic maps of alluvium and bedrock. The 5 geologic maps are complete and are being drafted on mylar for publication by the Tennessee Division of Geology. Publication will proceed when the U. S. Geological Survey publishes the final 5-color editions of the base maps about April, 1966.

Structure contour maps have been drawn, and cross sections and a 3,500-foot stratigraphic column are in preparation. A report on the Highland Rim surface on which the structure is located has been prepared for publication. Studies of fracture patterns and joint patterns already begun will be pursued further after geologic maps are submitted for publication.

For a summary of current knowledge of the structure, see pages 1 and 2 of the statement of May 15, 1965.

CURRENT WORK ON THE PROJECT

Geologic Mapping

All problems relating to geologic mapping have been solved on all four  $7\frac{1}{2}$  minute quadrangles and the special basin map. Because much of the area is covered with alluvium and deep residuum, some mapping was done on the basis of soils and residual chert. About three-quarters of the area has been mapped by the U. S. Department of Agriculture, Soil Conservation Service, and therefore most of the alluvium cover could be mapped

from their data. We have had to expend much effort, however, over the whole area, to map bedrock on the basis of residual chert fragments. This work has been finished, and we feel that in units 50 to 100 feet thick recognition of residual chert zones is a useful tool in geologic mapping.

Mapping of residual cherts was facilitated in the uppermost zones of the Mississippian by the cooperation and advice of geologists of the U. S. Geological Survey, Water Resources Division in Tennessee, and Geologic Division in Kentucky.

First drafts of legends for all five geologic maps have been prepared, and we have cooperated with geologists of the Tennessee Division of Geology to prepare brief reports on the mineral resources of the four  $7\frac{1}{2}$  minute quadrangles. Such reports invariably accompany their publication of geologic maps of quadrangles.

#### Structure Mapping

Structure contours (contour interval 20 feet outside the structure and 50 feet inside, scale 2,000 feet to the inch) have been drawn for the entire area on top of the Warsaw Limestone, and for the southern two-thirds of the area we are now preparing a structure map on top the Fort Payne Formation. These maps are to be adjusted to the geologic map and serve as a double check on the map patterns.

A page-size copy of the structural contour map on top the Warsaw Limestone (contour interval 50 feet) is included in this report.

#### Measurement of Stratigraphic Sections

About 50 sections, both on the surface and in drill holes, have been measured and described. About 20 of these are surface sections measured and described by H. A. Tiedemann, James A. Hulme, and

assistants. They comprise nearly a complete section about 3,500 feet thick. This is to be the basis for a Masters thesis by Hulme. John M. Wilson of the Tennessee Division of Water Resources, has worked with us, and through his contacts with drilling contractors has acquired and logged 30 sets of water well samples. Ten of these wells are within the faulted area, and add greatly to structural and stratigraphic knowledge of the region.

The composite section from both surface and drill holes is being prepared and will accompany our final report on the area.

#### Reports on Key Areas

Mr. Tiedemann is now concentrating his efforts on special sets of drawings, photographs, maps, and descriptive text for particularly significant and well exposed areas within the Wells Creek structure. These will certainly form a valuable supplement to the final report.

#### Orientation of Joints and Fractures

During the past summer, students measured joint sets in the vicinity but outside of the structure. At a later date, when the maps are finished, we will return to this project to compare them with joints inside the structure. Available data suggest that some joints go directly through (post-date the structure) but some are inclined (and probably pre-date the structure). The bedding fabric studies already made show a strong fabric that may be accounted for by a pattern of pre-structure jointing.

Fracture patterns, examined in detail, suggest that there is a "shock fracture fabric" related to shatter cones in the same rock. We will return to this fascinating possibility when the maps are all fully prepared for publication.

### Papers Prepared for Publication

A report on development of the terrain of the Western Highland Rim has been prepared for publication. This was the subject of a paper presented at the Baton Rouge Meeting of the Southeastern Section of The Geological Society of America in the spring of 1964 (See Status Report of June 1, 1964). [REDACTED]

### Loss of Personnel

Mrs. Owen T. Marsh resigned as of August, 1965. She is currently teaching geology at Fredonia University of New York State. She is still available for preparation of the final reports on gravity, shatter cones, and bedding orientation.

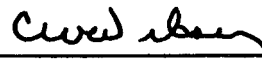
Mr. Herbert A. Tiedemann, our Research Assistant in field geology will join the staff of N.A.S.A. at Goddard Space Flight Center in February.

As a result of these losses and the hoped-for-increase in geology majors, our progress is slowed somewhat, but we anticipate being able to make great progress next summer as we pursue the relations of fracture patterns to the main structure, shatter cones, and joints.

### Progress of Student Assistants

During work on the project six undergraduates were employed, giving each his first practical experience as geologists. Two of these are still undergraduates at Vanderbilt, majoring in geology. Two are graduate students working for Masters degrees in geology. One has already received his Masters degree. The sixth is currently working as a geologist without a graduate degree.

NASA Grant NsG-465, Report of December 15, 1965

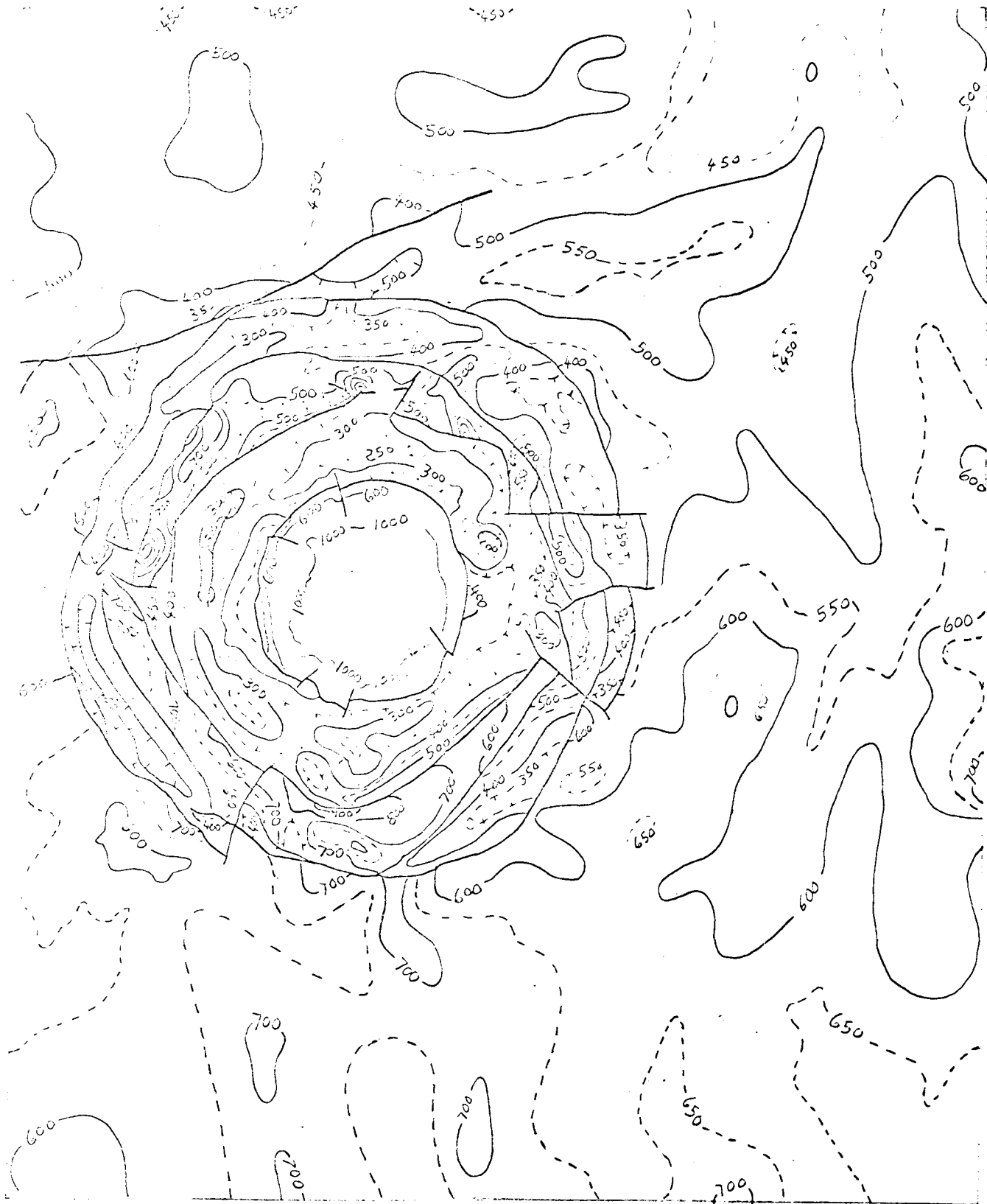
  
\_\_\_\_\_  
Charles W. Wilson, Jr.

  
\_\_\_\_\_  
Richard G. Stearns

Attachments: Structural contour map  
Report on Highland Rim

# CONTOURS ON TOP OF WARSAW LIMESTONE

ERIN 15 MINUTE QUADRANGLE



SCALE  
1 2 3 4 MILES

CONTOUR INTERVAL 50 FEET